

# TerraTek Research

October 21, 1983

Mr. Tom Tetting  
4241 State Office Building  
Division of Oil, Gas and Mining  
Salt Lake City, Utah 84114

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DIVISION OF  
OIL, GAS & MINING

Dear Mr. Tetting:

Presented here are the results of measurements performed on soil samples from the Red Rock Mine in San Juna County, Utah. Measured soil properties include: permeability to waste water, mechanical compaction and electrical resistivity of the water saturated material.

Soil was supplied as a dry, partially disaggregated material. Samples from discrete areas within the proposed pond site were fully disaggregated in the laboratory and blended to provide a uniform, representative sample. Approximately 50 gms of this blended material was used to prepare the test specimen.

Permeability to liquid was measured using a steady-state, one dimensional flow technique. Previous to measuring permeability, the specimen was compacted and saturated with waste water. Compaction, saturation and permeability measurements were performed at room temperature and hydrostatic stress representative of that which is likely to exist below the pond bottom.

Permeability to waste water was calculated using Darcy's law and data obtained from laboratory measurements. Darcy's law for steady-state, one dimensional flow is:

$$K = \frac{Q}{\Delta P} \mu \frac{\ell}{A}$$

where: K = permeability (darcy)  
Q = flowrate of permeating fluid (cm<sup>3</sup>/sec)  
 $\Delta P$  = pressure drop across sample (bar)  
 $\mu$  = viscosity of permeating fluid (cp)  
 $\ell$  = length of sample (cm)  
A = cross-sectional area of sample (cm<sup>2</sup>)

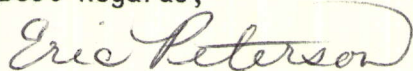
Electrical resistivity of the saturated sample was measured by applying an alternating current signal to the sample and measuring the resulting voltage drop. These data, together with Ohm's law and measured specimen geometry, were used to calculate resistivity. The average of six measurements, performed using a 1 KHz signal source, is reported in the attached summary of results.

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Mechanical compaction of the disaggregated sample was measured to assess the effect of saturation and application of hydrostatic stress. Change in sample length, occurring over the test duration, is reported in the attached summary of results.

Should you have any questions about the techniques used or results obtained, please give me a call at 584-2486.

Best Regards,

A handwritten signature in cursive script that reads "Eric Peterson".

Eric Peterson  
Senior Project Engineer  
Production Research  
TERRA TEK RESEARCH

EP/alm

Enclosure



## SUMMARY OF TEST RESULTS

Client: Mr. Robin Groff, TS&R Mining, Moab, Utah

Sample Origin: Red Rock Mine, San Juan County, Utah. Waste water pond site.

Sample Type: Recombined, disaggregated soil. Depth of burial - 18 feet

Sample Geometry: Length: 0.56 inches (initial unsaturated)  
Diameter: 2.00 inches

Test Conditions: Hydrostatic Stress - 20 psi  
Temperature - 72°F

Test Type	Measured Value
Permeability to Waste Water	$2.40 \times 10^{-4}$ darcy
Mechanical Compaction (Change in Length During Test, See Text)	7% (0.040 in/ 0.560 in)
Electrical Resistivity of Saturated Specimen	1.152 ohm/cm